Middle School Bridging Activities for the Chihuahuan Desert Lab

Students will begin preparation for participating in the Chihuahuan Desert Lab in elementary and middle school years. Basic principles of science, scientific concepts, measurement skills and scientific methodology will be introduced and skill levels will increase with grades. The following is a sequential grade level program for middle school students that will effectively transition students into high school biology and environmental science, and on to Chihuahuan Desert Lab field experience.

Sixth Grade (General Science)

General Science is intended to develop the students' understanding of the relationship between science and the world in which we live. The class will include the basic laws governing physical, chemical and biological sciences. Laboratory exercises are included as appropriate.

Seventh Grade (Life Science)

Life Science is designed to give the student a meaningful experience in the fundamentals of the features and functions of living things. This course should enable the student to judge this field as a possible career choice or as an area for further study.

Eighth Grade (Regular Earth Science)

General topics to be covered in Regular Earth Science include composition and origin of Earth materials, composition and characteristics of the hydrosphere and atmosphere, oceanography, processes of surface and internal changes, geologic history, the environment including renewable and nonrenewable resources and the universe and our future in space. Lab activities will include determining the identity of rocks and minerals, use and explanation of topographic maps, collecting and use of weather data, etc. Added emphasis will be placed on local concerns and interest in Earth Science and related areas (energy resources, water conservation, speleology, etc.

Eighth Grade (Accelerated Earth Science)

This course will include content areas listed for Earth Science-8R, with an increased emphasis on lab activities, in-depth study and problem solving. Each student will prepare a scientific paper and competition research project during the year.

Specific content and methods suggested for each grade level will be listed under Chihuahuan Desert Lab project areas.

Revegetation Project

- **Energy**
  Living systems require energy that comes in the form of food or the sun. Sun provides energy for plants. Plants provide energy for humans. The energy involved in the chemical reactions – photosynthesis and respiration. Grades 6 and 7.

- **Ecosystems**
  An ecosystem is a group of living and non-living things that interact. Under natural conditions changes in an ecosystem occur very slowly. Living and non-living things interact in the environment. Grade 6.
- **Structure of Living Organisms**
  The difference between living and non-living. The functions of a cell to the function of an entire organism. The anatomy and physiology of cells. Grades 6 and 7.
- **Plants**
  The life activities of plants (tropism). The characteristics of seed plants. The anatomy of gymnosperms and angiosperms. The functions of roots, stems and leaves. How see plants are classified and how they reproduce. Indigenous plants to the Chihuahuan Desert. Grade .7
- **Biomes**
  The six major biomes/regions of the earth with particular plant and animal communities. Grade 7.
- **Conservation**
  The relationships among organisms and their environment. The environment is a complex and fragile system, with limited resources, which is impacted by human decision and activity. Grade 7.
- **Pollution**
  Recognizing sources of pollution and the impact on the environment. Understanding and formulating ways to clean up pollution within the Chihuahuan Desert. Grade 8.
- **Soils**
  Understanding soil characteristics and chemical composition in relation to indigenous plants of the Chihuahuan Desert. Grade 8.
- **Weather**
  Recognizing local weather patterns and climatic changes that affect the desert environment. Grade 8.

Prairie Dog Project

- **Scientific Method**
  Introduction to the five step way of problem solving – identifying the problem, gathering data, forming a hypothesis, performing an experiment and forming conclusions. Grades 6, 7 and 8.
- **Measurement**
  Utilizing metric units for length, mass, time, temperature and volume. Students should demonstrate an ability to convert from one metric unit to another. Physical, Life and Earth Science will provide a variety of activities in which to practice measurement skills. Some measurements will be taken on a regular schedule and accuracy of measuring and observations will be emphasized. Grades 6, 7 and 8.
- **Animals**
  Differences and similarities between vertebrates and invertebrates. Differentiate among the five classes of vertebrates. Grades 6.
- **Classification**
  Different levels of scientific classifications – kingdom, phylum, class, order, family, genus and species. Grades 6 and 7.

- **Energy**
  The relationship between energy and food chains, food webs and food pyramids. Grades 6 and 7.
- **Social Behavior**
  The characteristics of social behavior in animals. Grade 7.
- **Ecology**
  Study of ecological communities and how they change over time. Grade 6.
  The major features of ecosystems, communities and populations. How communities change in size and how succession produces a climax community. Human impact on ecosystems. Keystone species. Grade 7.
- **Weather**
  The factors that interact to cause weather. Comparison of local and global wind patterns and explanations of how weather relates to local ecosystems. Grade 8.
- **Rock and Minerals**
  Understanding the formation and characteristics of rocks and minerals and their identification. Grade 8.
- **Soil**
  Soils deeply affect every other part of the ecosystem. Soils hold nutrients and water for plants and animals. Soils affect the chemistry of the water and the amount of water that returns to the atmosphere. Identification of soil properties, and how to test for each of these properties in a laboratory setting. Grade 8.
- **Social Studies**
  History of the Guadalupe Mountains, and as it relates to the black-tailed prairie dog (*Cynomys ludviciamus*). Population density studies of a variety of animal species. Grade 7.
- **Communication**
  Research and study skills. Formulating an experimental design paper based on individual or team science projects. Grades 6 and 8.

Cave Swallow Project

- **Classification**
  Common features of vertebrates. Five major classes of vertebrates. Classification of different types of birds based on beaks and feet – Birds of Prey, Perching Birds, Wading Birds, Non-perching Birds and Swimming Birds. Grades 6 and 7.
- **Birds**
  Characteristics – warm-blooded (maintaining a constant body temperature), Skeleton designed for flying, four-chambered heart, body covering of feathers, respiration by lungs and hard-shelled eggs laid on land. Grades 6 and 7.
- **Ecosystems**
  Ways in which living and nonliving parts of an ecosystem interact, and examples of ecological change. Abiotic components of ecosystems including moisture, solar energy and soil. Biotic components of ecosystems are organized into organisms, populations and communities, all of which interact with the abiotic components of the environment. Human-dominated ecosystems are regulated by the same laws as natural ecosystems. Grade 6.

- **Habitats and Niches**
  The place where an organism lives is its habitat, and there are many different kinds. An organism's niche is its role or job in its habitat. Organisms can share the same habitat. If two populations share the same niche, the population best-suited to the role will survive and reproduce. Grade 7.
- **Ecosystem Change**
  Ecosystems are in constant change. Populations increase and decrease and communities change through succession. Grades 6 and 7.
- **Cycles**
  Water, nitrogen, carbon dioxide, oxygen and other chemicals are cycled through ecosystems. Grades 6 and 8.
- **Energy**
  Energy from the sun flows through the ecosystems via food chains and food webs. Grades 6 and 7.
- **Geologic Time**
  Scientists have divided the geologic time scale into four eras – Precambrian, Paleozoic, Mesozoic and Cenozoic. The Mesozoic Era is thought to have begun about 225 million years ago. The Mesozoic Era is divided into the Triassic, Jurassic and Cretaceous periods. Geologic time lines. Grade 8.

Water Quality Project

- **Matter**
  All materials consist of matter. Every kind of matter has its own properties. Matter exists in four different states – solid, liquid, gas and plasma. A solid has a definite shape and volume. A liquid has a definite volume but not a definite shape. A gas does not have a definite volume or a definite shape. Matter cannot be created or destroyed. States of matter are determined by pressure and temperature. Matter can be changed from one state to another by adding or taking away heat. Grades 6 and 8.
- **Element**
  An element is a substance that cannot be broken down into similar substances by ordinary chemical means. An element can be described by its physical and chemical properties. Each element has a name and a chemical symbol. The smallest part of an element is an atom. Grade 6 and 8.
- **Molecule**
  A molecule is the smallest part of any substance that still has all of the properties of that substance. Grades 6 and 8.
- **Structure of Matter**
  Atoms are the building blocks of matter. Protons and neutrons are found in the nucleus. Electrons are arranged in energy level in the electron cloud. The atomic number is the number of protons in the nucleus of an atom of a substance. The mass number is the total number of protons and neutrons in an atom. Isotopes have the same number of protons but different number of neutrons. Charged atoms, called ions, have either gained or lost electrons. Grade 8.

- **Compounds**
  A compound is any combination of two or more different kinds of atoms. By losing, gaining or sharing electrons, atoms can combine to form compounds. Grade 8.
- **Fresh Water on the Earth's Surface**
  Fresh water is a natural resource found in lakes, ponds, rivers, streams, springs and glaciers. The water cycle is the continuous movement of water from the oceans and the sources of fresh water to the air and land and then back to the oceans. The three steps in the water cycle are called evaporation, condensation and precipitation. A land area in which surface runoff drains into a river or system of rivers and streams is called a watershed. Grades 6 and 8.
- **Fresh Water beneath the Earth's Surface**
  Fresh water beneath the Earth's surface is called groundwater. The water table is the underground level below which all of the pore spaces are filled with water. The water table separates the zone of aeration from the zone of saturation. The depth of the water table depends on the location of the groundwater, the climate of the area, the amount of rainfall, the type of soil and the number of wells drawing water. Groundwater formations include caverns, stalactites and stalagmites. Grade 8.
- **Water as a Solvent**
  Because of the polarity of water molecules, water is a good solvent. It can dissolve most substances. Water may be hard or soft and can easily become polluted. Grade 8.
- **Hydrology Investigations**
  Within the local watershed, a site will be selected where hydrology measurements (water temperature, transparency, pH, dissolved oxygen, alkalinity, electrical conductivity and nitrate) will be taken. All samples will be taken and measured roughly at the same time each day, on a weekly basis. Grade 8.
- **Quality Assurance and Quality Control**
  Accuracy refers to how close a measurement is to the true value. Precision means the ability to obtain consistent results. Reliability in both accuracy and precision is achieved by the following: collecting water samples as directed, performing tests immediately after collecting water samples, careful calibration, use and maintenance of testing equipment, following the specific directions of a protocol exactly as described, repeating measurements to check their accuracy and to understand any sources of error, and minimizing contamination of stock chemicals and testing equipment. Grade 8.
- **Disposal of Liquid Waste**
  After tests have been conducted, all solutions (except for the nitrate analysis) and liquids should be collected in a wide-mouth screw top plastic waste container and disposed of in a school sink or utility sink, and flushed with excess water. Or, they should be disposed of according to local school district's safety procedure guidelines. The wastes from the nitrate analysis should be disposed of according to local school district's safety procedure guidelines.
- **Conservation**
  People must conserve and protect their sources of fresh water, as there is a limited supply. In order to have enough water in the future, pollutants must be kept out of the water. Grades 6, 7 and 8.